

CHAPTER II

Preliminary Classification: 165
 Proposed Class: 104.19
 Subclass:

NOTE: "All applicants are requested to include a preliminary classification on newly filed patent applications. The preliminary classification, preferably class and subclass designations, should be identified in the upper right-hand corner of the letter of transmittal accompanying the application papers, for example "Proposed Class 2, subclass 129." M.P.E.P., § 601, 7th ed.

TRANSMITTAL LETTER
 TO THE UNITED STATES ELECTED OFFICE (EO/US)
 (ENTRY INTO U.S. NATIONAL PHASE UNDER CHAPTER II)

INTERNATIONAL APPLICATION NO. PCT/SE99/00086	INTERNATIONAL FILING DATE 22 JANUARY 1999	PRIORITY DATE CLAIMED 22 JANUARY 1998
TITLE OF INVENTION FROST RESISTANT HEATING/COOLING FLUID		
APPLICANT(S) STARZMANN, Martin		

Box PCT
 Assistant Commissioner for Patents
 Washington D.C. 20231
 ATTENTION: EO/US

CERTIFICATION UNDER 37 C.F.R. § 1.10*

(Express Mail label number is mandatory.)

(Express Mail certification is optional.)

I hereby certify that this Transmittal Letter and the papers indicated as being transmitted therewith is being deposited with the United States Postal Service on this date 1/27/2000, in an envelope as "Express Mail Post Office to Addressee" Mailing Label Number EJ890584260US, addressed to the Assistant Commissioner for Patents, Washington, D.C. 20231.

Christine A. Kotran

(type or print name of person mailing paper)

Christine A. Kotran

Signature of person mailing paper

WARNING: Certificate of mailing (first class) or facsimile transmission procedures of 37 C.F.R. § 1.8 cannot be used to obtain a date of mailing or transmission for this correspondence.

***WARNING:** Each paper or fee filed by "Express Mail" must have the number of the "Express Mail" mailing label placed thereon prior to mailing. 37 C.F.R. § 1.10(b).

"Since the filing of correspondence under § 1.10 without the Express Mail mailing label thereon is an oversight that can be avoided by the exercise of reasonable care, requests for waiver of this requirement will not be granted on petition." Notice of Oct. 24, 1996, 60 Fed. Reg. 56,439, at 56,442.

(Transmittal Letter to the United States Elected Office (EO/US) [13-18]—page 1 of 8)

002210-865538-09463598

NOTE: To avoid abandonment of the application, the applicant shall furnish to the USPTO, not later than 20 months from the priority date: (1) a copy of the international application, unless it has been previously communicated by the international Bureau or unless it was originally filed in the USPTO; and (2) the basic national fee (see 37 C.F.R. § 1.492(a)). The 30-month time limit may not be extended. 37 C.F.R. § 1.495.

WARNING: Where the items are those which can be submitted to complete the entry of the international application into the national phase are subsequent to 30 months from the priority date the application is still considered to be in the international state and if mailing procedures are utilized to obtain a date the express mail procedure of 37 C.F.R. § 1.10 must be used (since international application papers are not covered by an ordinary certificate of mailing—See 37 C.F.R. § 1.8.

NOTE: Documents and fees must be clearly identified as a submission to enter the national state under 35 U.S.C. § 371 otherwise the submission will be considered as being made under 35 U.S.C. § 111. 37 C.F.R. § 1.494(f).

- I. Applicant herewith submits to the United States Elected Office (EO/US) the following items under 35 U.S.C. § 371:
- a. ☒ This express request to immediately begin national examination procedures (35 U.S.C. § 371(f)).
 - b. ☒ The U.S. National Fee (35 U.S.C. § 371(c)(1)) and other fees (37 C.F.R. § 1.492) as indicated below:

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2. Fees

CLAIMS FEE	(1) FOR	(2) NUMBER FILED	(3) NUMBER EXTRA	(4) RATE	(5) CALCULATIONS
XXX	TOTAL CLAIMS	12 -20=	---	× \$18.00=	\$ ---
	INDEPENDENT CLAIMS	1 -3=	---	× \$78.00=	---
	MULTIPLE DEPENDENT CLAIM(S) (if applicable)			+ \$260.00	---
BASIC FEE**	<input type="checkbox"/> U.S. PTO WAS INTERNATIONAL PRELIMINARY EXAMINATION AUTHORITY Where an international preliminary examination fee as set forth in § 1.482 has been paid on the international application to the U.S. PTO: <ul style="list-style-type: none"> <input type="checkbox"/> and the international preliminary examination report states that the criteria of novelty, inventive step (non-obviousness) and industrial activity, as defined in PCT Article 33(1) to (4) have been satisfied for all the claims presented in the application entering the national stage (37 C.F.R. § 1.492(a)(4)) \$98.00 <input type="checkbox"/> and the above requirements are not met (37 C.F.R. § 1.492(a)(1)) \$670.00 				
	XXX U.S. PTO WAS NOT INTERNATIONAL PRELIMINARY EXAMINATION AUTHORITY Where no international preliminary examination fee as set forth in § 1.482 has been paid to the U.S. PTO, and payment of an international search fee as set forth in § 1.445(a)(2) to the U.S. PTO: <ul style="list-style-type: none"> <input type="checkbox"/> has been paid (37 C.F.R. § 1.492(a)(2)) \$760.00 <input type="checkbox"/> has not been paid (37 C.F.R. § 1.492(a)(3)) \$870.00 XXX where a search report on the international application has been prepared by the European Patent Office or the Japanese Patent Office (37 C.F.R. § 1.492(a)(5)) \$940.00				840.00
	Total of above Calculations				= 840.00
SMALL ENTITY	Reduction by 1/2 for filing by small entity, if applicable. Affidavit must be filed also. (note 37 C.F.R. § 1.8, 1.27, 1.28) (YES)				= 420.00
	Subtotal				420.00
	Total National Fee				\$ 420.00
	Fee for recording the enclosed assignment document \$40.00 (37 C.F.R. § 1.21(h)). (See item 13 below). See attached "ASSIGNMENT COVER SHEET". (YES)				40.00
TOTAL	Total Fees enclosed				\$ 460.00

430 Rec'd PCT/PTO 27 JAN 2000

*See attached Preliminary Amendment Reducing the Number of Claims.

- i. ☒ A check in the amount of \$460.00 to cover the above fees is enclosed.
 ii. ☐ Please charge Account No. _____ in the amount of \$ _____.
 A duplicate copy of this sheet is enclosed.

****WARNING:** To avoid abandonment of the application the applicant shall furnish to the United States Patent and Trademark Office not later than the expiration of 30 months from the priority date: *** (2) the basic national fee (see § 1.492(a)). The 30-month time limit may not be extended." 37 C.F.R. § 1.495(b).

WARNING: If the translation of the international application and/or the oath or declaration have not been submitted by the applicant within thirty (30) months from the priority date, such requirements may be met within a time period set by the Office. 37 C.F.R. § 1.495(b)(2). The payment of the surcharge set forth in § 1.492(e) is required as a condition for accepting the oath or declaration later than thirty (30) months after the priority date. The payment of the processing fee set forth in § 1.492(f) is required for acceptance of an English translation later than thirty (30) months after the priority date. Failure to comply with these requirements will result in abandonment of the application. The provisions of § 1.136 apply to the period which is set. Notice of Jan. 3, 1993, 1147 O.G. 29 to 40.

3. ☒ A copy of the international application as filed (35 U.S.C. § 371(c)(2)):

NOTE: Section 1.495 (b) was amended to require that the basic national fee and a copy of the international application must be filed with the Office by 30 months from the priority date to avoid abandonment. "The International Bureau normally provides the copy of the international application to the Office in accordance with PCT Article 20. At the same time, the International Bureau notifies applicant of the communication to the Office. In accordance with PCT Rule 47.1, that notice shall be accepted by all designated offices as conclusive evidence that the communication has duly taken place. Thus, if the applicant desires to enter the national stage, the applicant normally need only check to be sure the notice from the International Bureau has been received and then pay the basic national fee by 30 months from the priority date." Notice of Jan. 7, 1993, 1147 O.G. 29 to 40, at 35-36. See item 14c below.

- a. ☐ Is transmitted herewith.
 b. ☐ Is not required, as the application was filed with the United States Receiving Office.

c. ☒ has been transmitted

- i. ☒ by the International Bureau. 29 July
 Date of mailing of the application (from form PCT/1B/308): 1999
 ii. ☐ by applicant on _____ (Date).

4. ☒ A translation of the international application into the English language (35 U.S.C. § 371(c)(2)):

- a. ☐ Is transmitted herewith.
 b. ☒ Is not required as the application was filed in English.
 c. ☐ was previously transmitted by applicant on _____ (Date).
 d. ☐ will follow.

5. ~~xxx~~ Amendments to the claims of the International application under PCT Article 19 (35 U.S.C. § 371(c)(3)):

NOTE: The Notice of January 7, 1993 points out that 37 C.F.R. § 1.495(a) was amended to clarify the existing and continuing practice that PCT Article 19 amendments must be submitted by 30 months from the priority date and this deadline may not be extended. The Notice further advises that: "The failure to do so will not result in loss of the subject matter of the PCT Article 19 amendments. Applicant may submit that subject matter in a preliminary amendment filed under section 1.121. In many cases, filing an amendment under section 1.121 is preferable since grammatical or idiomatic errors may be corrected." 1147 O.G. 29-40, at 36.

- a. ☐ are transmitted herewith.
- b. ☐ have been transmitted
 - i. ☐ by the International Bureau.
Date of mailing of the amendment (from form PCT/1B/308): _____.
 - ii. ☐ by applicant on _____ (Date).
- c. ~~xxx~~ have not been transmitted as

- i. ~~xxx~~ applicant chose not to make amendments under PCT Article 19.
Date of mailing of Search Report (from form PCT/ISA/210.): 06 May 1999
- ii. ☐ the time limit for the submission of amendments has not yet expired.
The amendments or a statement that amendments have not been made will be transmitted before the expiration of the time limit under PCT Rule 46.1.

6. ~~xxx~~ A translation of the amendments to the claims under PCT Article 19 (38 U.S.C. § 371(c)(3)):

- a. ☐ is transmitted herewith.
- b. ☐ is not required as the amendments were made in the English language.
- c. ~~xxx~~ has not been transmitted for reasons indicated at point 5(c) above.

7. ~~xxx~~ A copy of the International examination report (PCT/IPEA/409)

~~xxx~~ is transmitted herewith.

- ☐ is not required as the application was filed with the United States Receiving Office.

8. ☐ Annex(es) to the International preliminary examination report (None)

- a. ☐ is/are transmitted herewith.
- b. ☐ is/are not required as the application was filed with the United States Receiving Office.

9. ☐ A translation of the annexes to the international preliminary examination report

- a. ☐ is transmitted herewith. (None)
- b. ☐ is not required as the annexes are in the English language.

10. ☒ ~~XX~~ ~~XX~~ An oath or declaration of the inventor (35 U.S.C. § 371(c)(4)) complying with 35 U.S.C. § 115

a. ☐ was previously submitted by applicant on _____ (Date).

b. ☒ ~~XX~~ ~~XX~~ is submitted herewith, and such oath or declaration

i. ☒ ~~XX~~ ~~XX~~ is attached to the application.

ii. ☐ identifies the application and any amendments under PCT Article 19 that were transmitted as stated in points 3(b) or 3(c) and 5(b); and states that they were reviewed by the inventor as required by 37 C.F.R. § 1.70.

c. ☐ will follow.

II. Other document(s) or information included:

11. ☒ ~~XX~~ ~~XX~~ An International Search Report (PCT/ISA/210) or Declaration under PCT Article 17(2)(a):

a. ☒ ~~XX~~ ~~XX~~ is transmitted herewith. (Attached to published appln. WO 99/37733)

b. ☐ has been transmitted by the International Bureau.

Date of mailing (from form PCT/IB/308): _____

c. ☐ is not required, as the application was searched by the United States International Searching Authority.

d. ☐ will be transmitted promptly upon request.

e. ☐ has been submitted by applicant on _____ (Date).

12. ☒ ~~XX~~ ~~XX~~ ~~XX~~ An Information Disclosure Statement under 37 C.F.R. §§ 1.97 and 1.98:

a. ☒ ~~XX~~ ~~XX~~ is transmitted herewith.

Also transmitted herewith is/are:

☒ ~~XX~~ ~~XX~~ Form PTO-1449 (PTO/SB/08A and 08B).

☒ ~~XX~~ ~~XX~~ Copies of citations listed.

b. ☐ will be transmitted within THREE MONTHS of the date of submission of requirements under 35 U.S.C. § 371(c).

c. ☐ was previously submitted by applicant on _____ (Date).

13. ☒ ~~XX~~ ~~XX~~ ~~XX~~ An assignment document is transmitted herewith for recording.

A separate ☐ "COVER SHEET FOR ASSIGNMENT (DOCUMENT) ACCOMPANYING NEW PATENT APPLICATION" or ☒ ~~XX~~ ~~XX~~ FORM PTO 1595 is also attached.

Assignee: Aspen Petroleum AB

Sjöportsgatan 2

417 64 Göteborg, Sweden

14. ☒ Additional documents:

- a. ☒ Copy of request (PCT/RO/101)
b. ☒ International Publication No. WO 99/37733
i. ☒ Specification, claims and drawing
ii. ☐ Front page only
c. ☒ Preliminary amendment (37 C.F.R. § 1.121)
d. ☒ Other

PCT/IB/308; PCT/IV/332; PCT/IPEA/416

15. ☒ The above checked items are being transmitted

- a. ☒ before 30 months from any claimed priority date.
b. ☐ after 30 months.

16. ☐ Certain requirements under 35 U.S.C. § 371 were previously submitted by the applicant on _____, namely:

AUTHORIZATION TO CHARGE ADDITIONAL FEES

WARNING: Accurately count claims, especially multiple dependant claims, to avoid unexpected high charges if extra claims are authorized.

NOTE: "A written request may be submitted in an application that is an authorization to treat any concurrent or future reply, requiring a petition for an extension of time under this paragraph for its timely submission, as incorporating a petition for extension of time for the appropriate length of time. An authorization to charge all required fees, fees under § 1.17, or all required extension of time fees will be treated as a constructive petition for an extension of time in any concurrent or future reply requiring a petition for an extension of time under this paragraph for its timely submission. Submission of the fee set forth in § 1.17(a) will also be treated as a constructive petition for an extension of time in any concurrent reply requiring a petition for an extension of time under this paragraph for its timely submission." 37 C.F.R. § 1.136(a)(3).

NOTE: "Amounts of twenty-five dollars or less will not be returned unless specifically requested within a reasonable time, nor will the payer be notified of such amounts; amounts over twenty-five dollars may be returned by check or, if requested, by credit to a deposit account." 37 C.F.R. § 1.26(b).

☒ The Commissioner is hereby authorized to charge the following additional fees that may be required by this paper and during the entire pendency of this application to Account No. 08-2441

☒ 37 C.F.R. § 1.492(a)(1), (2), (3), and (4) (filing fees)

WARNING: Because failure to pay the national fee within 30 months without extension (37 C.F.R. § 1.495(b)(2)) results in abandonment of the application, it would be best to always check the above box.

(Transmittal Letter to the United States Elected Office (EO/US) [13-18]—page 7 of 8)

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X ☒ 37 C.F.R. § 1.492(b), (c) and (d) (presentation of extra claims)

NOTE: Because additional fees for excess or multiple dependent claims not paid on filing or on later presentation must only be paid or these claims cancelled by amendment prior to the expiration of the time period set for response by the PTO in any notice of fee deficiency (37 C.F.R. § 1.492(d)), it might be best not to authorize the PTO to charge additional claim fees, except possible when dealing with amendments after final action.

X ☒ 37 C.F.R. § 1.17 (application processing fees)

X ☒ 37 C.F.R. § 1.17(a)(1)-(5) (extension fees pursuant to § 1.136(a).

☐ 37 C.F.R. § 1.18 (issue fee at or before mailing of Notice of Allowance, pursuant to 37 C.F.R. § 1.311(b))

NOTE: Where an authorization to charge the issue fee to a deposit account has been filed before the mailing of a Notice of Allowance, the issue fee will be automatically charged to the deposit account at the time of mailing the notice of allowance. 37 C.F.R. § 1.311(b).

NOTE: 37 C.F.R. § 1.28(b) requires "Notification of any change in loss of entitlement to small entity status must be filed in the application . . . prior to paying, or at the time of paying . . . issue fee." From the wording of 37 C.F.R. § 1.28(b): (a) notification of change of status must be made even if the fee is paid as "other than a small entity" and (b) no notification is required if the change is to another small entity.

X ☒ 37 C.F.R. § 1.492(e) and (f) (surcharge fees for filing the declaration and/or filing an English translation of an International Application later than 30 months after the priority date). (None required.)

Reg. No.: 24,603

Tel. No.: (216) 771-3800

Customer No.: IDON000367



SIGNATURE OF PRACTITIONER

D. Peter Hochberg

(type or print name of practitioner)

D. Peter Hochberg Co., L.P.A.

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1940 E. 6th Street - 6th Floor

Cleveland, OH 44114-2294

P1540905

PTO/SB/10 (12-97)
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**STATEMENT CLAIMING SMALL ENTITY STATUS
 (37 CFR 1.9(f) & 1.27(c))—SMALL BUSINESS CONCERN**

Docket Number (Optional)
 GP7287US

Martin Starzmann

Applicant, Patentee, or Identifier: _____

Application or Patent No. _____

Filed or Issued: (Filed herewith) _____

Title: Frost resistant heating/cooling fluid.

I hereby state that I am _____

☒ the owner of the small business concern identified below:

☐ an official of the small business concern empowered to act on behalf of the concern identified below:

NAME OF SMALL BUSINESS CONCERN Aspen Petroleum AB

ADDRESS OF SMALL BUSINESS CONCERN Sjöportsgatan 2, 417 64 GÖTEBORG, Sweden

I hereby state that the above identified small business concern qualifies as a small business concern as defined in 13 CFR Part 121 for purposes of paying reduced fees to the United States Patent and Trademark Office, in that the number of employees of the concern, including those of its affiliates, does not exceed 500 persons. For purposes of this statement, (1) the number of employees of the business concern is the average over the previous fiscal year of the concern of the persons employed on a full-time, part-time, or temporary basis during each of the pay periods of the fiscal year, and (2) concerns are affiliates of each other when either, directly or indirectly, one concern controls or has the power to control the other, or a third party or parties controls or has the power to control both.

I hereby state that rights under contract or law have been conveyed to and remain with the small business concern identified above with regard to the invention described in:

- ☐ the specification filed herewith with title as listed above.
☐ the application identified above.
☐ the patent identified above.

If the rights held by the above identified small business concern are not exclusive, each individual, concern, or organization having rights in the invention must file separate statements as to their status as small entities, and no rights to the invention are held by any person, other than the inventor, who would not qualify as an independent inventor under 37 CFR 1.9(c) if that person made the invention, or by any concern which would not qualify as a small business concern under 37 CFR 1.9(d), or a nonprofit organization under 37 CFR 1.9(e).

- Each person, concern, or organization having any rights in the invention is listed below:
☐ no such person, concern, or organization exists.
☐ each such person, concern, or organization is listed below.

Separate statements are required from each named person, concern or organization having rights to the invention stating their status as small entities. (37 CFR 1.27)

I acknowledge the duty to file, in this application or patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small entity is no longer appropriate. (37 CFR 1.29(b))

NAME OF PERSON SIGNING X JAN LINDBLAD

TITLE OF PERSON IF OTHER THAN OWNER CEO

ADDRESS OF PERSON SIGNING X SJÖPORTSGATAN 2, 417 64 GÖTEBORG

SIGNATURE X [Signature]

DATE X 22/12/99

Burden Hour Statement: This form is estimated to take 0.2 hours to complete. Time will vary depending upon the needs of the individual case. Any comments on the amount of time you are required to complete this form should be sent to the Chief Information Officer, Patent and Trademark Office, Washington, DC 20231. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Assistant Commissioner for Patents, Washington, DC 20231.

00463558-012700

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant : Martin Starzmann
Serial No. :
Filed : (Herewith)
Title : FROST RESISTANT HEATING/COOLING FLUID
Examiner :
Group :
Attorney File : GP7287US (#90225)

Box PCT
Assistant Commissioner for Patents
Washington, D.C. 20231

PRELIMINARY AMENDMENT

Sir:

Prior to examination of the referenced application, please amend the application without prejudice as follows:

In the claims:

Please amend the claims as follows:

1. (Amended) A frost resistant heating/cooling fluid containing alkali salts of acetic acid and/or formic acid, [characterized in that it] wherein the fluid further contains a corrosion inhibitor [in the form of] consisting of a mixture selected from the group of [a] C₅-C₁₆ monocarboxylic acid; [or] alkali-salt, ammonium-salt, [or] and amino-salts of [said] C₅-C₁₆ monocarboxylic acid[.]; [a] C₅-C₁₆ dicarboxylic acid, [or] alkali-salt, ammonium-salt and [or] amino-salts of [said] C₅-C₁₆ dicarboxylic acid[.]; and [also] a triazole.

2. (Amended) A cooling fluid according to claim 1, [characterized in that it] wherein the fluid contains between 5 and 50 weight-% alkali salts of an acid selected from the group consisting of acid and/or] formic acid calculated on the weight of the fluid.

3. (Amended) A cooling fluid according to claim 1 [or 2], [characterized in that it] wherein the fluid contains between 0.4 and 10 weight-%[, preferably between 0.5 and 2 weight-%] of the corrosion inhibitor, calculated on the total weight of the cooling fluid.

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4. (Amended) A cooling fluid according to [any one of the preceding claims, characterized in that it] claim 1, wherein the fluid contains between 0.02 and 3 weight-% [of] selected from the group consisting of monocarboxylic acid, [or] alkali-salt, ammonium-salt and [or] amino-salts of said acid, calculated on the total weight of the cooling fluid.

5. (Amended) A cooling fluid according to claim 4, [characterized in that it] wherein the fluid contains between 0.02 and 3 weight-% selected from the group consisting of [the] dicarboxylic acid; [or] alkali-salt, ammonium-salt and [or] amino-salts of said acid, calculated on the total weight of the cooling fluid.

6. (Amended) A cooling fluid according to claim 4 [and 5, characterized in that it], wherein the fluid contains between 0.02 and 2 weight-% triazole calculated on the total weight of the cooling fluid.

7. (Amended) A cooling fluid according to [any one of any of the preceding claims, characterized in that] claim 1, wherein said monocarboxylic acid is an aliphatic C₅-C₁₆ monocarboxylic acid, [preferably] selected from the group of octanoic acid, nonoic acid, decanoic acid, undecanoic acid [or] and dodecanoic acid[.]; 2-ethyl hexanoic acid and neodecanoic acid.

8. (Amended) A cooling fluid according to [any one or any of the preceding claims, characterized in that] claim 1, wherein said dicarboxylic acid is a C₈-C₁₂ aliphatic dicarboxylic acid selected from the group of suberic acid, azealic acid, sebacic acid, undecanoic di-acid, dodecanoic di-acid and the di- acid of di-cyclopentadienyldide.

9. (Amended) A cooling fluid according to [any one or any of the preceding claims, characterized in that] claim 1, wherein said dicarboxylic acid is a C₈-C₁₂ aromatic dicarboxylic acid[, preferably terephthalic acid].

10. (Amended) A cooling fluid according to [any one or any of the preceding claims, characterized in that] claim 1, wherein the triazole is selected from the group consisting of tolyltriazole [or] and benzotriazole.

Please add the following new claims:

--11. A cooling fluid according to claim 3 wherein the fluid contains between 0.5 and 2 weight-% of the corrosion inhibitor, calculated on the total weight of the cooling fluid.

12. A cooling fluid according to claim 9 wherein said C₈-C₁₂ aromatic dicarboxylic acid is terephthalic acid.--

REMARKS

The amendments presented herein are made to eliminate multiple-dependency in the claims, to correct informalities in the claims, and to place the application more in conformance with U.S. patent practice. Entry of the foregoing amendments is respectfully requested, and examination on the merits of the application is earnestly solicited.

Respectfully submitted,

By: 

D. Peter Hochberg
Reg. No. 24,603

DPH/ck

D. Peter Hochberg Co., L.P.A.
1940 E. 6th Street - 6TH Floor
Cleveland, Ohio 44114-2294
(216) 771-3800

CERTIFICATION UNDER 37 CFR 1.10

I hereby certify that the foregoing Preliminary Amendment and any document(s) referred to as attached hereto is being deposited with the United States Postal Service on the date noted below in an envelope as "Express Mail Post Office to Addressee" mailing Label Number EJ890584260US addressed: Box PCT, Assistant Commissioner for Patents, Washington, D.C. 20231

Christine A. Kotran

(Type name of person mailing paper)

Date January 27, 2000


(Signature of person mailing paper)

5

Frost resistant heating/cooling fluid

Technical field

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The present invention relates to a frost resistant, aqueous heating/cooling fluid, containing alkali salts of acetic acid and/or formic acid. The heating/cooling fluid is intended for transport of cold or heat in industrial cooling plants, cooling systems in vessels and vehicles, cooling systems for skating ice in sports centres, heat exchangers, district heating systems, heat pumps, solar panels etc.

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Background of the invention

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In aqueous heating/cooling fluids, frost resistance is usually obtained by means of an addition of ethylene glycol. Ethylene glycol is a liquid which is mixable with water to any extent, exhibits a low risk of fire and explosion, and is frost resistant and also colourless and odourless. The lowest solidifying point (-57 °C) of a glycol-water mixture is at a ethylene glycol content of 60 volume-%. However, the disadvantage with ethylene glycol is its high degree of toxicity. Thereby, it poses an environmental threat if it ends up in the sea, lakes and streams, for instance, if cooling liquid is discharged or leaks out.

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From EP-B-0 306 972, a partially or completely glycol-free, aqueous cooling fluid is known, which contains an addition of sodium acetate and sodium formate or potassium acetate and potassium formate in certain ratios. By means of this fluid composition, a freezing temperature pf -70 °C or lower can be obtained. The fluid composition exhibits all the advantages with the conventional glycol-water mixture, at the same time as it does not exhibit its toxicity.

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However, the above-mentioned cooling fluid contains strong ions, wherein it is very important to have a good corrosion protection. In EP-B-0 306 972, it is disclosed that benzoic acid, sodium benzoate, potassium benzoate or benzotriazole are used for corrosion

protection. These are film-forming chemicals. The formed film protects metal surfaces from corrosion attacks. In order not to risk local corrosion attacks, the film layer has to be intact across the entire metal surface. A disadvantage with the film is an impaired heat transfer between the metal surface and the cooling fluid.

Purpose of the invention and most important features

The purpose of the present invention is to provide a corrosion protected heating/cooling fluid of the above-mentioned type, which exhibits an effective heat transfer between metal surface and fluid, at the same time as the corrosion protection is excellent. This has been achieved by means of the fluid containing a corrosion inhibitor in the form of a mixture of a C₅-C₁₆ monocarboxylic acid or alkali-, ammonium- or amino-salts of said acid, a C₅-C₁₆ dicarboxylic acid or alkali-, ammonium- or amino-salts of said acid, and also a triazole.

The content of alkali salts of acetic acid and/or formic acid in the heating/cooling fluid should preferably be between 5 and 50 weight-%, calculated on the total weight of the fluid.

The heating/cooling fluid contains between 0.4 and 10 weight-%, preferably between 0.5 and 2 weight-% of the above-mentioned corrosion inhibitor, calculated on the total weight of the alkali salts of acetic acid and/or formic acid.

Summary of the invention

From the above-mentioned EP-B-0 306 972, it is known that an addition of alkali salts of certain anions, mainly acetates and formates, to water results in a strong depression of freezing-point of an aqueous medium. The depression of freezing-point becomes particularly large at certain mixing ratios of the included salts.

The heating/cooling fluid according to the invention contains between 5 and 50 weight-% alkali salts of acetic acid and/or formic acid calculated on the weight of the fluid, primarily sodium acetate, potassium acetate, sodium formate and/or potassium formate. The included salts can be present in any mutual mixing ratio, i.e. only one of the salts or two or several salts in a mixture together. Partly depending on the total salt content, and partly on the

mixing ratio of the salts, different depressions of freezing-point of the fluid is obtained. Also other freezing-point depressing additions can be included in the fluid, e.g. urea.

The heating/cooling fluid according to the invention is a strong ionic solution, wherein the significance of an efficient corrosion protection is particularly large. EP-B-0 306 972 discloses an addition of a corrosion inhibitor in the form of benzoic acid, sodium benzoate, potassium benzoate or benzotriazole, which are film-forming chemicals which create a protective film on metals surfaces and thereby protects them from corrosion attacks. As mentioned above, the disadvantages with this type of corrosion inhibitors is partly that the film layer must be intact across the entire metal surface in order to make the corrosion protection effective and to avoid local corrosion attacks, and partly that the heat transfer between metal surface and heating/cooling fluid is impaired.

According to the invention, it has now surprisingly been found that, in addition to an excellent corrosion protection, an addition of a corrosion inhibitor in the form of a mixture of a C_5-C_{16} monocarboxylic acid or alkali-, ammonium- or amino-salts of said acid, and also a triazole, furthermore provides an excellent heat transfer between the metal surface and the fluid.

A corrosion inhibitor of this type is disclosed in US-A-4,647,392. According to this document, the corrosion inhibitor is intended to be used in glycol-water mixtures. The use as a corrosion inhibitor in salt solutions of the type which the invention relates to, however, is not disclosed in the U.S. patent.

The amounts of the components included in the corrosion inhibitor can vary between 0.02 and 3 weight-%, calculated on the weight of the fluid, for both the monocarboxylic acid and the dicarboxylic acid or the alkali-, ammonium-, or amino-salts of said acid. The amount of triazole can vary between 0.02 and 2 weight-%, calculated on the total weight of the fluid.

The total content of the corrosion inhibitor should be between 0.4 and 10 weight-%, preferably between 0.5 and 2 weight-%, calculated on the weight of the fluid.

The corrosion inhibitor comprises a mixture of three basic components, namely a monocarboxylic acid, a dicarboxylic acid and a triazole. The monocarboxylic acid is preferably an aliphatic C₅-C₁₆ monocarboxylic acid, preferably selected from the group of octanoic acid, nonanoic acid, decanoic acid, undecanoic acid or dodecanoic acid, 2-ethyl hexanoic acid and neodecanoic acid.

The dicarboxylic acid is preferably either a C₈-C₁₂ aliphatic dicarboxylic acid selected from the group of suberic acid, azelaic acid, sebacic acid, undecanoic di-acid, dodecanoic di-acid and the di-acid of di-cyclopentadienylyde or a C₈-C₁₂ aromatic dicarboxylic acid, preferably terephthalic acid.

The triazole is preferably tolyltriazole or benzotriazole.

In comparison with using only one of the acid types, the combination of mono- and dicarboxylic acid or its salts provides a synergistic effect when the corrosion protection of metallic surfaces is concerned. The triazole is specifically used as a copper protection.

Other conventional corrosion-inhibiting components can of course also be included in the heating/cooling fluid according to the invention.

Example

In order to test the heat transfer characteristics, a system in which the liquid which is to be tested is circulating with a constant volume flow under constant pressure was used. This liquid passes a metal coupon onto which a heating device is applied. The temperature of the liquid is kept constant by means of a cooling coil. The temperature of the metal coupon is measured and recorded over time. An increase of the temperature in the metal coupon indicates a relative impairment of the heat transfer ability over the same time.

The liquids which were tested exhibited the following compositions:

	INCLUDED COMPONENTS (weight-%)	Reference - Cooling fluid with conventional inhibitor	Test - Cooling fluid with inhibitor according to the invention
5	Water	49.8	60
	Potassium acetate	31.2	31.2
	Potassium formate	7.8	7,8
	Sodium benzoate	1.1	-
	Tolyoltriazole	1.7	-
10	Borax	0.3	-
	Sodium meta-phosphate	1	-
	Sodium nitrate	1.8	-
	Sodium silicate	0.3	-
	Glycerol	5	-
15	Corrosion inhibitor acc. to the invention	-	1

The following results were obtained for the heat transfer characteristics:

	Test duration (h)	Reference Coupon temperature (°C)	Reference Coupon temperature (°C)
20	0	170	170
	10	181	171
	20	183	171
	30	184	171.5
25	40	186	171
	45	188	171.5

As is evident from these results, the test liquid, which comprised an addition of a corrosion inhibitor according to the invention, gave a very small increase of the temperature in the

metal coupon over time, something which indicates a maintained effective heat transfer between the metal surface and the fluid. The reference, however, which contained a conventional corrosion inhibitor essentially in accordance with EP 306,972, exhibited a significant increase of the temperature in the metal coupon in the course of time and, accordingly, a relative impairment of the heat transfer ability in the same time period.

This difference is thought to be the result of the corrosion inhibitor in the reference fluid forming a film between fluid and metal surface, which impairs the heat transfer. It is presumed that such a film formation, however, does not take place when utilizing the corrosion inhibitor according to the invention.

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5 **Claims**

1. A frost resistant heating/cooling fluid containing alkali salts of acetic acid and/or formic acid,
characterized in that it also contains a corrosion inhibitor in the form of a mixture
10 of a C₅-C₁₆ monocarboxylic acid or alkali-, ammonium-, or amino-salts of said acid, a C₅-
C₁₆ dicarboxylic acid or alkali-, ammonium- or amino-salts of said acid, and also a triazole.
2. A cooling fluid according to claim 1,
characterized in that it contains between 5 and 50 weight-% alkali salts of acetic
15 acid and/or formic acid calculated on the weight of the fluid.
3. A cooling fluid according to claim 1 or 2,
characterized in that it contains between 0.4 and 10 weight-%, preferably between
0.5 and 2 weight-% of the corrosion inhibitor, calculated on the total weight of the cooling
20 fluid.
4. A cooling fluid according to any one or any of the preceding claims,
characterized in that it contains between 0.02 and 3 weight-% of the
monocarboxylic acid or alkali-, ammonium- or amino-salts of said acid, calculated on the
25 total weight of the cooling fluid.
5. A cooling fluid according to claim 4,
characterized in that it contains between 0.02 and 3 weight-% of the dicarboxylic
acid or alkali-, ammonium- or amino-salts of said acid, calculated on the total weight of
30 the cooling fluid.
6. A cooling fluid according to claim 4 and 5,
characterized in that it contains between 0.02 and 2 weight-% triazole calculated
on the total weight of the cooling fluid.

7. A cooling fluid according to any one of any of the preceding claims,
c h a r a c t e r i z e d i n that said monocarboxylic acid is an aliphatic C_5-C_{16}
monocarboxylic acid, preferably selected from the group of octanoic acid, nonaic acid,
decanoic acid, undecanoic acid or dodecanoic acid, 2-ethyl hexanoic acid and neodecanoic
acid.

8. A cooling fluid according to any one or any of the preceding claims,
c h a r a c t e r i z e d i n that said dicarboxylic acid is a C_8-C_{12} aliphatic dicarboxylic acid
selected from the group of suberic acid, azealic acid, sebacic acid, undecanoic di-acid,
dodecanoic di-acid and the di-acid of di-cyclopentadienyliide.

9. A cooling fluid according to any one or any of the preceding claims,
c h a r a c t e r i z e d i n that said dicarboxylic acid is a C_8-C_{12} aromatic dicarboxylic
acid, preferably terephthalic acid.

10. A cooling fluid according to any one or any of the preceding claims,
c h a r a c t e r i z e d i n that the triazole is tolyltriazole or benzotriazole.

DECLARATION FOR PATENT APPLICATION

Checklist Number (Optional)

As a below named inventor, I hereby declare that:

7-15409US

My residence, post office address and citizenship are as stated below next to my name.

Attorney file: GP7287US

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled **Frost resistant heating/cooling fluid**, the specification of which

is attached hereto unless the following box is checked:

☐ was filed on _____ as United States Application Number or PCT International Application Number _____ and was amended on _____ (if applicable).

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, § 1.56(a).

I hereby claim foreign priority benefits under Title 35, United States Code, § 119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed.

Prior Foreign Application(s)

9800152-2

Sweden

22.01.1998

Priority Claimed

(Number)

(Country)

(Day/Month/Year Filed)

☒ Yes ☐ No

(Number)

(Country)

(Day/Month/Year Filed)

☐ Yes ☐ No

(Number)

(Country)

(Day/Month/Year Filed)

☐ Yes ☐ No

I hereby claim the benefit under Title 35, United States Code, § 120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, § 112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, § 1.56(a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application.

(Application Number)

(Filing Date)

(Status - patented, pending, abandoned)

(Application Number)

(Filing Date)

(Status - patented, pending, abandoned)

I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith:

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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Full name of sole or first inventor (given name, family name) **Martin Starzmann**Inventor's signature *[Signature]* Date **X 12/12/1999**Residence **GÖTEBORG** Citizenship **Swedish**Post Office Address **Skärsgratan 68, 412 69 GÖTEBORG, Sweden**

Full name of second joint inventor, if any (given name, family name)

Second inventor's signature _____ Date _____

Residence _____ Citizenship _____

Post Office Address _____

☐ Additional inventors are being named on a separate sheet attached hereto.